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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of Andrew McIntosh Soutar et al. Art Unit 1762
Serial No. 10/099,936
Filed March 13, 2002
Confirmation No. 3281
For SOLDERABILITY ENHANCEMENT BY SILVER IMMERSION PRINTED CIRCUIT BOARD MANUFACTURE
Examiner Brian K. Talbot

January 2, 2006

SECOND AMENDED APPEAL BRIEF

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APPEAL BRIEF

This is an appeal from the final rejection of the claims of the above-referenced application made in the Office action dated October 6, 2005. A Notice of Appeal was filed on April 3, 2006.

The Commissioner is hereby authorized to charge the fee for the Appeal Brief in the amount of $500.00 to Deposit Account No. 19-1345.

I. REAL PARTY IN INTEREST

The real party in interest is Enthone Inc., a corporation of the State of Delaware, owner of a 100 percent interest in the pending application.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any pending appeals or interferences which may be related to, directly affect or be directly affected by, or have a bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

The following is a statement of the status of all claims:

Claims 1-17. Canceled.

Claims 18-26. Rejected.

Claims 27-31. Canceled.

Claims 32-40. Rejected.

The claims being appealed are claims 18-26 and 32-40.

A copy of the pending claims 18-26 and 32-40 appears in the Claims Appendix of this Brief.

The pending claims stand rejected under 35 U.S.C. §112 on the basis of the examiner's assertion that there is not support in the original disclosure for "fatty amides" which is an element of all of claims 18-26 and 32-40. It is also asserted that the original disclosure lacks support for "oxidant" which appears in claims 20, 23, 26, 34, 37, and 40.

The rejections of all of these claims are being appealed.

IV. STATUS OF AMENDMENTS

No amendments have been filed after the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter defined in each of the independent claims (18, 24, 32, 38) involved in the appeal, referring to the specification by page and line number (there are no drawings):

Claim 18: This claim is directed to a process for immersion plating of silver onto a metal surface by treating the surface with a solution (specification page 16 lines 19-23 and page 19, lines 20-22) comprising a) a soluble source of silver ions (specification page 14, line 12); b) an acid (specification page 24, lines 17-18, and 24-25); and c) an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing (specification page 22, lines 10-15).

Claim 24: This claim is directed to a solution for for immersion plating comprising i) a soluble source of silver ions (specification page 14, line 12); ii) an acid (specification page 24, lines 17-18, and 24-25); and iii) an additive selected from the group

consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing (specification page 22, lines 10-15).

Claim 32: This claim is directed to process for improving solderability of a metal surface by contacting the surface with an immersion silver plating solution and thereafter treating the surface with a solution (specification page 16, lines 24-26) comprising an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing (specification page 22, lines 10-15).

Claim 38: This claim is directed to an immersion silver plating solution comprising an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing (specification page 22, lines 10-15).

The invention relates to plating of silver onto a metal surface to improve the solderability of the surface. The plating is achieved by so-called "immersion" plating which differs from electroplating because in immersion plating no external current is applied. The invention has special applicability to plating silver onto copper elements of printed circuit boards, to preserve their solderability for subsequent manufacturing operations.

Each of the independent claims in this application focuses on the specific tarnish inhibitors disclosed in paragraph [0072] of applicants' published application (2002/0150692), e.g.:

18. A process for improving the solderability of a metal surface, said process comprising treating the metal surface with an immersion silver plating solution, said solution comprising:

a). a soluble source of silver ions;
b). an acid;

c). an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing.

The other independent claims are essentially the same with respect to the first salient issue on appeal -- whether "fatty amides" is supported by the original specification.

The second salient issue on appeal -- whether "oxidant" is supported by the specification -- is manifest in six of the dependent claims, e.g.:

20. A process according to claim 18 wherein the silver plating solution also comprises an oxidant.

The present application is a continuation of application 08/939,656, which is now U.S. Pat. 6,395,329. A parallel continuation issued as 6,860,925. A sample claim in 6,395,329 is as follows:

1. A method for coating a printed circuit board having metal pads, metal through-holes or a combination thereof, the metal pads, metal through-holes or the combination thereof being formed of a first metal, the method comprising the steps of:

contacting the metal pads, the metal through-holes or the combination thereof with a bright-etch composition to form etched pads, etched through-holes or a combination thereof, the etched pads, the etched through-holes or the combination thereof being formed of the first metal; and

contacting the etched pads, the etched through-holes or the combination thereof with a plating composition comprising ions of a second metal, the second metal being different from the first metal, and a tarnish inhibitor, the tarnish inhibitor characterized in that it coexists with the second metal in solution, to form a printed circuit board having pads, through-holes or a combination thereof that are formed of the first

metal coated by a separate layer of the second metal and by a layer of the tarnish inhibitor.

A sample claim in 6,860,925 is as follows:

1. A plating solution comprising: a solvent; metallic ions dissolved in the solvent; and a tarnish inhibitor in the solvent, the tarnish inhibitor characterized in that it does not cause the dissolved metallic ions to precipitate in the solution.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There are two grounds for rejection which have been made final by the Office and are presented for review:

1. The Office's assertion that there is no support in the original specification for the term "fatty amides" in claims 18, 24, 32, and 38; and

2. The Office's assertion that there is no support in the original specification for the term "oxidant" in dependent claims 20, 23, 26, 34, 37, and 40.

The Office asserts there is no support in the original disclosure for "fatty amides" and "oxidant." These are the grounds for the rejection for which appellants request review. All 18 pending claims require "fatty amides"; only six pending claims require "oxidant":

A. Appellants appeal the rejection of the following 12 claims -- which require "fatty amides," *but not* "oxidant" -- on the basis that the Office's assertion is incorrect that original disclosure lacks support for "fatty amides":

18 19

21 22

24 25

32 33

35 36

38 39

B. Appellants appeal the rejection of the following six claims -- which recite "oxidant" *and* "fatty amides" -- on the basis that the Office's assertion is incorrect that original disclosure lacks support for "oxidant" and "fatty amides":

20 23

26 34

37 40

VII. ARGUMENT

A. Claims 18, 19, 21, 22, 24, 25, 32, 33, 35, 36, 38, and 39

These claims recite "fatty amides" but do not recite "oxidant," so the only rejection basis relevant to these claims is whether there is support in the original specification for "fatty amides." Written description support for "fatty amides" is found at page 22, line 13 [Paragraph 0072 of published application No. US 2002/0150692]:

> "(a) **fatty acid amines**, preferably having at least 6 carbon atoms, most preferably at least 10 carbon atoms and generally no greater than 30 carbon atoms, **they may be** primary, secondary, tertiary, diamines, amine salts, **amides**, ethoxylated amines,ethoxylated diamines, quaternary ammonium salts, quaternary diammonium salts, ethoxylated quaternary ammonium salts, ethoxylated amides and amine oxides. Examples of the primary, secondary and tertiary amine type corrosion inhibitors are ARMEEN™ to (™ denotes trademark). Examples of the subsequent amine type corrosion inhibitors are respectively DUOMEEN™, ARMAC ™/DUOMAC, ARMID™, ETHOMEEN™, ETHODUONEEN™, ARQUAD™,

DUOQUAD™, ETHOQUAD™, ETHOMID™, AROMOX ™, all supplied by Akzo Chemie." (Emphasis added.)

This same paragraph appears in the priority application, now 6,395,329, at column 10, line 10 ff, and at page 22, line 10 ff of the originally filed applications -- both present application 10/099,936, and 08/839,656 which matured into 6,395,329.

This paragraph states "they may be ... amides ...." "They" clearly refers back to the "fatty acid amines." So the "amides" linked to the "fatty acid amines" by "they" must also be "fatty." An amide is, by definition, "a product of a reaction between a carboxylic acid and an amine." If an amine is "fatty," its corresponding amide must also be "fatty." That is, the reaction from an amine to an amide does not destroy the compound's long hydrocarbon chain, so the corresponding amide compound is also "fatty."

Accordingly, one skilled in the art would understand "amides" at page 22, line 13 to be referring to amides which are, in fact, fatty, such that "fatty amides" is supported literally. And, in particular, one would understand applicants to have been in possession of the invention comprising silver plating with a composition comprising among other components, fatty amides, for solderability enhancement.

Moreover, even if the cited passage of the specification were deemed to fall short of literal support, claim language is supported if the disclosure "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *Lampi Corp. v. American Power Products Inc.*, 56 USPQ2d 1445, 1455 (Fed. Cir. 2000). It is not necessary that the claim language such as "fatty amides" be supported in exact terms:

> [W]e are mindful that appellant's specification need not describe the claimed invention in ipsis verbis to comply with the written description requirement. The test is whether the originally filed specification disclosure reasonably conveys to a person having ordinary skill that applicant had possession of the subject matter later claimed. *In re Sorenson*, 3 USPQ2d 1462, 1463 (BPAI 1987).

The claim language under scrutiny in *Sorenson* included "copper complexes of imines," "binuclear copper complexes of carboxylic acids," and "a binuclear copper complex of an aliphatic carboxylic acid or binuclear copper complex of an aryl carboxylic acid." *Sorenson*, 3 USPQ2d at 1463. The examiner in Sorenson acknowledged that the specification contained broader expressions that encompassed the claim language at issue, including "an organic compound of copper", "copper complexes of carboxylic acids," "copper complex of an aliphatic carboxylic acid," and the "copper complex of an aryl carboxylic a[cid]. The examiner nonetheless rejected the claims for failing to satisfy the written description requirement. The Board reversed and found that, although the specification did not use the exact language found in the claims, the disclosure as a whole reasonably conveyed to the skilled artisan that the applicant had possession of the claimed subject matter. Id. at 1463-64. Here, a skilled artisan reading the specification's disclosure of "fatty amines," which "may be...amides," would immediately recognize that applicants had possession of an immersion silver plating solution comprising a fatty amide additive. The written description requirement of Section 112 is satisfied.

B. Claims 20, 23, 26, 34, 37, and 40

These claims require "fatty amides" *and* "oxidant." There is support for "fatty amides" for the reasons stated immediately

above. Also, written description support for "oxidant" is provided, for example, by the numerous references in the original specification to "nitric acid" as a component of the plating composition (E.g., paragraphs 0086, 0103, 0123, and 0125). Nitric acid is a known oxidant and a known oxidant for copper:

> U.S. PAT. 4,846,918, Col. 1, lns 58-64
> In the nitric acid etching chemistry disclosed in U.S. Pat. Nos. 4,497,687 and 4,545,850, nitric acid reacts with copper according to the relationship
>
> $3Cu+8HNO_3 = 3Cu(NO_3)_2 +2NO+4H_2O$
>
> with the **nitric acid serving both as an oxidant and as an anion source for the dissolved copper.**

> U.S. PAT. 5,362,712; Claim 1
> 1. . . . to dissolve the copper mold . . . **nitric acid is simultaneously used as said mineral acid and said oxidizing agent . . . .**

> U.S. PAT. 5,037,482; Col. 5, lns 23 ff.
> The oxidizer must be of a type, and present in an amount, sufficient to provide in cooperating interaction with the surfactant, a controlled conversion of the copper surface from a substantially smooth surface to a substantially clean, substantially uniformly micro-roughened surface, so that the bonding characteristics of the copper surface are substantially increased for securely adhering a subsequently applied coating to the copper surface, without at the same time removing the copper surface itself from the underlying substrate to which it is adhered. An oxidizing agent which is too active, and/or which is used in too substantial concentrations, not only runs the risk of uncontrolled stripping of the copper surface from its underlying substrate, but more importantly has been found ineffective to produce the required micro-roughened topography on the remaining **copper surface. Results such as this have been found with compositions containing nitric acid as the oxidizer.** Even where

> complete stripping is avoided, the remaining copper surface is nevertheless surprisingly smooth and unacceptable for promoting adhesion of subsequently applied coatings. [Nitric acid was discussed in the context of the prior art; and the inventors preferred methane sulfonic acid over nitric acid.]

Nitric acid in the context of these solutions is well understood to provide nitrate ions which facilitate oxidization of Cu to Cu^{+1} and/or Cu^{+2} by the most basic of chemical re-dox reactions.

In light of the state of the knowledge in the art, the specification's disclosure of "nitric acid" – a known oxidant for copper – reasonably conveys to the artisan that applicants had possession of immersion silver plating solutions comprising an oxidant. Therefore, the written description requirement of Section 112 is satisfied.

C. THE OFFICE HAS NOT MADE A *PRIMA FACIE* SHOWING

Because the written description requirement does not require in *ipsis verbis* support in the specification, the Office bears "the initial burden of presenting evidence or reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims." *In re Wertheim*, 191 USPQ 90, 97 (CCPA 1976); *In re Alton*, 37 USPQ2d 1578, 1583 (Fed. Cir. 1996).

The *Wertheim* court found that the Patent Office did "nothing more than to argue lack of literal support." *Wertheim*, 191 USPQ at 98. The court found this inadequate:

> If lack of literal support alone were enough to support a rejection under § 112, then the statement of *In re Lukach* that "the invention claimed does not have

> to be described in ipsis verbis in order to satisfy the description requirement of § 112," is empty verbiage. *Id.* (citations omitted).

Here, the Office has not provided sufficient evidence or reasoning for concluding that the written description requirement is not satisfied for "fatty amides" or "oxidant." More importantly, the disclosure "reasonably conveys to a person having ordinary skill that applicant had possession of the subject matter later claimed," i.e., of silver plating using compositions containing fatty amides and an oxidant to improve solderability.

D. Conclusion

Claims 18, 19, 21, 22, 24, 25, 32, 33, 35, 36, 38, and 39 should be allowed because there is adequate support in the specification for the term "fatty amides." Claims 20, 23, 26, 34, 37, and 40 should be allowed because there is adequate support in the specification for "oxidant" and "fatty amides." Appellants therefore respectfully request the rejections be reversed and these two groups of pending claims be allowed.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

Rejected claims under appeal: 18-26, 32-40.

1. (Canceled) A method for coating a printed circuit board comprising an insulating layer and a conducting layer, with metal pads and/or through-holes in which the pads and/or through-holes are provided with an anti-tarnish coating, the method comprising contacting the pads and/or through-holes with a bright-etch composition in a bright-etch step; and subsequently metal plating the etched pads and/or through-holes by contact with a plating composition comprising ions of a metal which is more electropositive then the metal from which the pads and/or through-holes are formed and being substantially free of reducing agent for said ions in an immersion metal placing step to form solderable plated metal surfaces.

2. (Canceled) A method according to claim 1 in which the plated metal surfaces are contacted with a solution of a tarnish inhibitor.

3. (Canceled) A method for coating a printed circuit board comprising an insulating layer and a conducting layer, with metal pads and/or through-holes in which the pads and/or through-holes are provided with an anti-tarnish coating, the method comprising metal plating the etched pads and/or through-holes by contact with a plating composition in a metal plating step to form solderable plated metal surfaces and contacting the plated metal surfaces with a solution of tarnish inhibitor.

4. (Canceled) A method according to claim 1 in which the metal plating step is a method in which a metal which is more

electropositive than the metal of the said pads and/or through-holes is immersion/displacement coated from an aqueous solution containing ions of the more electropositive metal substantially free of reducing agent for said ions.

5. (Canceled) A method according to claim 1 in which the plating composition contains a complexing agent for the said ions, preferably a multidentate ligand complexing agent.

6. (Canceled) A method according to claim 1 or claim 3 in which the plating composition comprises a tarnish inhibitor and in the process, the metal surfaces are contacted with a solution comprising a tarnish inhibitor during the plating step, so that the tarnish inhibitor is present in the metal plating composition.

7. (Canceled) A method according to claim 1 or claim 3 in which the metal plated surfaces are formed in the plating step and subsequently the pre-formed plated metal surfaces are contacted with a solution comprising a tarnish inhibitor in a postrinse second step.

8. (Canceled) A method according to claim 2 or claim 3 in which the contact time of the plated metal surfaces with the solution comprising a tarnish inhibitor is from 10 seconds to 5 minutes.

9. (Canceled) A method according to claim 2 or claim 3 in which the metal surfaces are contacted with a solution comprising a tarnish inhibitor by dip coating or spray coating.

10. (Canceled) A method according to claim 2 or claim 3 in which the tarnish inhibitor in present in the solution in an amount of from 0.001 to 5% by weight of the solution.

11. (Canceled) A method according to claim 1 in which the metal coating of the plated metal surfaces comprise nickel, silver, tin, lead, palladium, cobalt, gold, platinum or bismuth or their alloys, preferably silver.

12. (Canceled) A method according to claim 1 in which the pads or through-holes are formed of copper.

13. (Canceled) A method according to claim 1 including a preliminary step of applying to exposed conductor traces at the surface of the PCB a mask which is an insulator, such that the pads and/or through-holes are left exposed.

14. (Canceled) A method according to claim 1 including a subsequent step of attaching conducting components to the metal plated pads and/or through-holes using solder in direct contact with the metal plating.

15. (Canceled) An aqueous plating composition suitable for forming an immersion plating of a relatively more electropositive metal on a relatively less electropositive metal substrate containing ions of the more electropositive metal and a complexing agent for the ions and a tarnish inhibitor for the more electropositive metal and being substantially free of reducing agent for said ions.

16. (Canceled) A composition according to claim 15 in which the tarnish inhibitor is present in the solution in an amount of from 0.001 to 5% by weight of the composition.

17. (Canceled) A composition according to claim 15 in which the said ions are of nickel, silver, tin, lead, palladium, cobalt, gold, platinum or bismuth or their alloys, preferably silver.

18. (Rejected) A process for improving the solderability of a metal surface, said process comprising treating the metal surface with an immersion silver plating solution, said solution comprising:

a). a soluble source of silver ions;

b). an acid;

c). an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing.

19. (Rejected) A process according to claim 18 wherein the silver plating solution also comprises material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives and benzimidazole derivatives.

20. (Rejected) A process according to claim 18 wherein the silver plating solution also comprises an oxidant.

21. (Rejected) A process according to claim 18 wherein the metal surface comprises copper.

22. (Rejected) A process according to claim 21 wherein the silver plating solution also comprises a material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives, and benzimidazole derivatives.

23. (Rejected) A process according to claim 22 wherein the silver plating solution also comprises an oxidant.

24. (Rejected) An immersion silver plating solution comprising

(i) a soluble source of silver ions,

(ii) an acid and

(iii) an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing.

25. (Rejected) An immersion plating solution according to claim 24 also comprising a material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives, and benzimidazole derivatives.

26. (Rejected) An immersion plating solution according to claim 24 also comprising an oxidant.

27. (Canceled) A process for improving the solderability of a metal surface, said process comprising treating the metal surface with an immersion silver plating solution, said solution comprising:

a). a soluble source of silver ions;

b). an acid; and

c). an additive that substantially prevents silver migration by providing a barrier to moisture.

28. (Canceled) A process for improving the solderability of a metal surface, said process comprising:

a). contacting the metal surface with an immersion silver plating solution thereby producing an immersion silver plate upon the metal surface; and

b). treating the immersion silver plated metal surface with a solution comprising an additive that substantially prevents silver migration by providing a barrier to moisture.

29. (Canceled) A process according to claim 28, wherein the solution described in step (b) is distinct from the immersion plating solution of step (a), and step (b) is performed after step (a).

30. (Canceled) A process according to claim 28, wherein the additive is a component of the immersion silver plating solution.

31. (Canceled) An immersion silver plating solution comprising (i) a soluble source of silver ions, (ii) an acid and (iii) an additive that substantially prevents silver migration by providing a barrier to moisture.

32. (Rejected) A process for improving the solderability of a metal surface, said process comprising:

a). contacting the metal surface with an immersion silver plating solution thereby producing an immersion silver plate upon the metal surface; and thereafter

b). treating the immersion silver plated metal surface with a solution comprising an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing.

33. (Rejected) A process according to claim 32 wherein the silver plating solution comprises a material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives and benzimidazole derivatives.

34. (Rejected) A process according to claim 32 wherein the silver plating solution also comprises an oxidant.

35. (Rejected) A process according to claim 32 wherein the metal surface comprises copper.

36. (Rejected) A process according to claim 35 wherein the silver plating solution comprises a material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives and benzimidazole derivatives.

37. (Rejected) A process according to claim 36 wherein the silver plating solution also comprises an oxidant.

38. (Rejected) An immersion silver plating solution comprising an additive selected from the group consisting of fatty amines, fatty amides, quaternary salts, and ethoxylated versions of any of the foregoing.

39. (Rejected) An immersion plating solution according to claim 38 also comprising a material selected from the group consisting of imidazoles, benzimidazoles, imidazole derivatives, and benzimidazole derivatives.

40. (Rejected) An immersion plating solution according to claim 38 also comprising an oxidant.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

There are no related appeals or interferences.